

EXHIBIT 28



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Transcript of Todor Cooklev, Ph.D.

Date: April 8, 2022

Case: TQ Delta -v- Commscope Holding Company, Inc., et al.

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1 IN THE UNITED STATES DISTRICT COURT

2 FOR THE EASTERN DISTRICT OF TEXAS

3 MARSHALL DIVISION

4 -----x

5 TQ DELTA, LLC, :

6 Plaintiff, : Civil Action No.

7 v. : 2:21-CV-310-JRG

8 COMMSCOPE HOLDING COMPANY, INC., : (Lead Case)

9 COMMSCOPE INC., ARRIS :

10 INTERNATIONAL LIMITED, ARRIS :

11 GLOBAL LTD., ARRIS US HOLDINGS, :

12 INC., ARRIS SOLUTIONS, INC., :

13 ARRIS TECHNOLOGY, INC., and :

14 ARRIS ENTERPRISES, LLC, :

15 Defendants. :

16 -----x

17 (caption continued on next page)

18
19 VIDEOTAPED DEPOSITION OF TODOR COOKLEV, PH.D.

20 Conducted Virtually

21 Friday, April 8, 2022

22 1:05 p.m. EDT

23 Job No.: 444695

24 Pages: 1 - 93

25 Reported by: Monique Vouthouris, CCR, RPR, CRR

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1 (caption continued)

2 -----x

3 TQ DELTA, LLC, :
4 Plaintiff, : Civil Action No.
5 v. : 2:21-CV-309-JRG
6 NOKIA CORP., NOKIA SOLUTIONS : (Member Case)
7 AND NETWORKS OY, and NOKIA :
8 OF AMERICA CORP., :
9 Defendants. :

10 -----x

11 NOKIA OF AMERICA CORP., :
12 Third-Party Plaintiff, :
13 v. :
14 BROADCOM CORP., BROADCOM INC., :
15 and AVAGO TECHNOLOGIES :
16 INTERNATIONAL SALES PTE. LTD., :
17 Third-Party Defendants.:

18 -----x

19
20 VIDEOTAPED DEPOSITION OF TODOR COOKLEV,
21 PH.D., pursuant to notice, conducted virtually via
22 Zoom Videoconference, before Monique Vouthouris,
23 CCR, RPR, CRR, Notary Public in and for the States
24 of New Jersey and New York.
25

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A P P E A R A N C E S

ON BEHALF OF TQ DELTA, LLC, AND

THE WITNESS, TODOR COOKLEV, PH.D.:

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(continued)

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A P P E A R A N C E S C O N T I N U E D

ON BEHALF OF NOKIA:

NICHOLAS C. MARAIS, ESQ.

M. SCOTT STEVENS, ESQ.

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ALSO PRESENT:

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BRIAN KRIEGER, Planet Depos Technician

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C O N T E N T S

EXAMINATION OF TODOR COOKLEV, PH.D.	PAGE
By Mr. Marais	8

E X H I B I T S

(Attached to transcript.)

COOKLEV DEPOSITION EXHIBIT	PAGE
Exhibit 1 Curriculum Vitae of Todor Cooklev, Ph.D., 21 pages.	11
Exhibit 2 Declaration of Dr. Todor Cooklev in Support of Plaintiff's Opening Claim Construction Brief.	15
Exhibit 3 ITU-T Recommendation G.992.3, TQD_TX00085136 through 85447.	25
Exhibit 4 ITU-T Recommendation G.993.1, TQD_TX00125252 through 125479.	27
Exhibit 5 U.S. Patent 7,844,882, Resource Sharing in a Telecommunications Environment, November 30, 2010.	47
Exhibit 6 Convolutional Interleaver demonstrative, 4 pages.	52

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E X H I B I T S C O N T I N U E D

(Attached to transcript.)

COOKLEV DEPOSITION EXHIBIT PAGE

Exhibit 7 U.S. Patent 7,453,881, Systems 75
and Methods for Multi-Pair ATM
Over DSL, November 18, 2008.

Exhibit 8 U.S. Patent 9,154,354, Systems 78
and Methods for a Multicarrier
Modulation System with a
Variable Margin, October 6, 2015.

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P R O C E E D I N G S

THE VIDEOGRAPHER: It is the beginning of Media Number 1 of the videotaped deposition of Dr. Todor Cooklev in the matter of TQ Delta, et al., versus Commscope Holding, et al., as well as TQ Delta, et al., versus Nokia, et al., in the U.S. District Court for the Eastern District of Texas, Marshall Division, Case Number 2:21-CV-310-JRG and Case Number 2:21-CV-309-JRG.

Today's date is April 8, 2022. The time on the video monitor is 1:06 p.m. Eastern Standard Time. The certified videographer today is Jean-Louis Ziesch representing Planet Depos. This video deposition is taking place remotely.

Would counsel please identify yourself and state whom you represent.

MR. MARAIS: Nic Marais from Alston & Bird on behalf of Nokia, and I have with me my colleagues Scott Stevens, Karlee Wroblewski and Katie Donald.

MS. WALSH: Rachel Walsh on behalf of the Commscope defendants, from Goodwin Procter.

MR. HURT: Christian Hurt. I'm here this afternoon on behalf of the witness and the plaintiff.

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1	THE VIDEOGRAPHER: The court reporter	13:07:15
2	today is Monique Vouthouris representing Planet	13:07:16
3	Depos. Would the court reporter please swear in the	13:07:23
4	witness.	13:07:25
5	TODOR COOKLEV, PH.D.,	13:07:47
6	being first duly sworn or affirmed by the Notary,	13:07:47
7	testifies as follows:	13:08:17
8	EXAMINATION	13:08:17
9	BY MR. MARAIS:	13:08:17
10	Q Can you please state your name?	13:08:23
11	A Todor Cooklev.	13:08:25
12	Q And you've been retained on behalf of the	13:08:27
13	plaintiff here today, TQ Delta?	13:08:31
14	A Yes.	13:08:33
15	Q And you're being compensated by the	13:08:34
16	plaintiff TQ Delta for your time?	13:08:37
17	A Yes.	13:08:40
18	Q And you understand that you're under oath	13:08:40
19	today?	13:08:43
20	A I do.	13:08:43
21	Q So you also understand that you should	13:08:45
22	give the same seriousness and truthfulness in	13:08:48
23	answering my questions today as you would if you	13:08:52
24	were before a judge or a jury.	13:08:56
25	A Yes, I understand that.	13:08:58

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1	exist by itself?	14:16:24
2	MR. HURT: Object to the form.	14:16:30
3	A Well, did I say that you put the	14:16:31
4	interleaver on a hardware component? I'm not sure I	14:16:37
5	said that. I said you can implement an interleaver	14:16:41
6	in hardware. Can you -- can that hardware exist by	14:16:49
7	itself before you implement the interleaver? I --	14:17:06
8	well, that -- that I was going to give a general	14:17:38
9	answer, but I'm not sure that I investigated this	14:17:45
10	when I was working on the declaration.	14:17:52
11	Q So you said earlier that it's the	14:18:01
12	interleaver that reorders bytes; correct?	14:18:08
13	A Generally, yes.	14:18:13
14	Q And it reorders those bytes into a	14:18:14
15	different sequence of bytes?	14:18:17
16	A Yes, that's the reordering.	14:18:21
17	Q And then that sequence of bytes is	14:18:23
18	transmitted by a transmitter?	14:18:25
19	MR. HURT: Object to the form.	14:18:28
20	A Yeah, and just -- just a comment, you said	14:18:29
21	different sequence of bytes. It is different in the	14:18:34
22	sense that the order of the bytes will be different.	14:18:40
23	I mean, the interleaver will change the order, but	14:18:44
24	it's not going to change the bytes themselves.	14:18:47
25	Q Okay. Let me rephrase. The transmitter	14:18:50

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1	transmits the interleaved stream of bytes; right?	14:18:53
2	A Yes.	14:19:00
3	Q And a receiver receives that interleaved	14:19:01
4	stream of bytes; right?	14:19:04
5	A The receiver will receive whatever the	14:19:07
6	transmitter is sending.	14:19:12
7	Q And then the receiver makes available to a	14:19:13
8	de-interleaver those -- that sequence of bytes to	14:19:18
9	de-interleave; correct?	14:19:25
10	MR. HURT: Object to the form.	14:19:27
11	A Yes.	14:19:28
12	Q I would like to go back to your	14:19:34
13	declaration, please, and we can turn to page 22.	14:19:36
14	A I'm there.	14:19:45
15	MR. MARAIS: And, Brian, if we could bring	14:19:51
16	that up on the screen, please, that would be great.	14:19:55
17	THE TECHNICIAN: Stand by.	14:19:58
18	MR. MARAIS: Thank you.	14:19:59
19	THE TECHNICIAN: On-screen.	14:20:06
20	Q So, Dr. Cooklev, in paragraph 68 on this	14:20:07
21	-- in your declaration you talk about interleaving	14:20:13
22	and deinterleaving, and you say that interleaving	14:20:16
23	contributes to latency, and that's in the second	14:20:18
24	line there of paragraph 68; correct?	14:20:21
25	A Yes.	14:20:25

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1	Q	For the record, that's page 52 of the	16:16:48
2		document, of Dr. Cooklev's declaration.	16:16:50
3	A	So the question is a multicarrier symbol?	16:18:34
4	Q	That's right.	16:18:38
5	A	I'm looking at my declaration. So	16:19:37
6		multicarrier symbol is a signal that comprises a	16:19:40
7		plurality of carriers where each carrier	16:19:56
8		individually is modulating a bit or a collection of	16:20:00
9		bits.	16:20:08
10	Q	And in arriving at that definition, is	16:20:11
11		that something that you got from the patent that you	16:20:15
12		reviewed in this case?	16:20:20
13	A	Multicarrier symbol is a known term of	16:20:34
14		art.	16:20:40
15	Q	Do you know if multicarrier symbol was	16:20:43
16		disclosed in the specifications or the written	16:20:46
17		descriptions of the patents you reviewed for this	16:20:51
18		case?	16:20:53
19	A	Excuse me, what is the question?	16:20:54
20	Q	Do you know whether the term "multicarrier	16:20:57
21		symbol" was disclosed in the patents of the -- or	16:21:00
22		the patents that you reviewed in drafting -- or in	16:21:07
23		drafting and putting together your declaration	16:21:09
24		today, that we're talking about today?	16:21:14
25	A	Do I know whether the multicarrier	16:21:16

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1	symbol --	16:21:18
2	MR. HURT: Object to the form.	16:21:20
3	A -- is disclosed in these patents?	16:21:20
4	Q That's correct.	16:21:26
5	A Well, yes, I do know that the term is	16:21:32
6	disclosed.	16:21:38
7	MR. MARAIS: I'm going to bring in another	16:21:47
8	document, please.	16:21:49
9	A At least -- at least in some, in some of	16:21:50
10	the patents.	16:21:57
11	Q So I'm presenting U.S. Patent Number	16:22:09
12	9,154,354.	16:22:14
13	A I downloaded it.	16:22:30
14	(Cooklev Exhibit 8 marked for	16:22:30
15	identification.)	16:22:32
16	THE TECHNICIAN: Exhibit 8 on-screen.	16:22:32
17	Q Dr. Cooklev, you reviewed this patent in	16:22:34
18	drafting your declaration; correct?	16:22:41
19	A Yes.	16:22:43
20	Q And this patent is one of the patents the	16:22:46
21	parties are calling a Family 10 patent?	16:22:50
22	A I believe that's correct.	16:22:53
23	Q So do you believe that the term	16:22:56
24	"multicarrier symbol" is in this patent or is	16:22:59
25	disclosed in this patent? And if so, can you please	16:23:02

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1	point me to where?	16:23:06
2	MR. HURT: Object to the form.	16:23:07
3	A Well, the term "multicarrier modulation	16:23:41
4	system" is -- appears in the title of this patent.	16:23:47
5	Q Is that the same thing as a multicarrier	16:23:56
6	symbol?	16:23:59
7	A Well, not completely. A person of skill	16:24:01
8	reading this patent would understand that a	16:24:10
9	multicarrier modulation system produces multicarrier	16:24:14
10	symbols, in general.	16:24:24
11	Q To be clear, can you please let me know	16:24:28
12	where in this patent it uses the term "multicarrier	16:24:31
13	symbol"?	16:24:37
14	A Well, this term, the term exactly	16:24:53
15	"multicarrier symbol" appears in the claims of this	16:24:56
16	patent.	16:25:02
17	Q Okay. So it does not appear anywhere in	16:25:03
18	the written description of the patent?	16:25:06
19	MR. HURT: Object to the form.	16:25:10
20	A But even if it doesn't, it doesn't need to	16:25:16
21	appear because the term "multicarrier symbol" was	16:25:22
22	known to a person of skill at the time of the	16:25:32
23	invention.	16:25:35
24	Q Sorry, my question was within the written	16:25:39
25	description, which -- and the written description is	16:25:42

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1 robust reception or the first SNR margin provides 16:45:39
2 more robust reception than the second SNR margin. 16:45:44
3 So the more robust reception is not due to other 16:45:48
4 factors in the context of the claim. 16:45:52

5 Q Sorry. Are you done? 16:45:58

6 A Yes, I am. 16:45:59

7 Q Can you please tell me where in the 16:46:01
8 specification of the '354 patent or in the Family 10 16:46:04
9 patents does the term "robustness" appear in 16:46:11
10 relation to a subchannel or carrier? 16:46:14

11 A Yes, I think I can at least in column 2, 16:47:18
12 the paragraph starting with line 18, this paragraph 16:47:25
13 explains that, and it's towards the end of this 16:47:40
14 paragraph -- well, starting with line 26, "For 16:47:48
15 example, if the system is operating at the 6 dB 16:48:05
16 margin, for example, 4 bits are allocated to 16:48:10
17 carriers with 27.5 dB SNR for bit error rate 1 times 16:48:18
18 10 to the power of minus 7." So, then "the 16:48:27
19 crosstalk levels can increase by 6 dB and the system 16:48:38
20 will still be operating at the required 1 times 10 16:48:43
21 to the power minus 7 bit error rate." 16:48:43

22 So in this passage the specification is 16:48:55
23 relating to SNR margin per carrier giving an example 16:48:58
24 of -- well, 6 dB margin for all carriers in this 16:49:09
25 example, so 6 dB margin for all carriers, then -- 16:49:26

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1 then there will be 4 bits allocated to carriers with 16:49:31
2 27.5 dB SNR. And the -- after this paragraph the 16:49:36
3 specification says there's a trade-off between the 16:49:51
4 robustness of the channel and the achievable data 16:49:54
5 rate. 16:49:58

6 Q Okay. Are you done? 16:50:04

7 A I am. 16:50:05

8 Q Would you agree looking at column 2, those 16:50:08
9 lines you just read to me, let's look at line 26 16:50:11
10 where it starts with "For example," do you see that? 16:50:16

11 A Yes. 16:50:23

12 Q And it says if this system, do you agree 16:50:24
13 that it's talking about the system here? 16:50:29

14 A Yes, it clearly says the system. 16:50:33

15 Q And then it gives some characteristics of 16:50:36
16 the system; correct? 16:50:41

17 A It says, "if the system is operating at 16:50:44
18 the 6 dB margin." 16:50:47

19 Q Yeah. And then it goes on and says -- 16:50:51
20 again, you pointed to the SNR, right, just one line 16:50:54
21 down, or two lines down. 16:50:58

22 A Yes. 16:51:02

23 Q And then again it says after the crosstalk 16:51:03
24 levels gets increased by 6 decibels, again it says 16:51:08
25 and the system will be operating; correct? 16:51:12


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CERTIFICATE OF CERTIFIED SHORTHAND REPORTER

I, MONIQUE VOUTHOURIS, New Jersey License No. 30XI00083400, the officer before whom the foregoing remote deposition was taken, do hereby certify that the foregoing transcript is a true and correct record of the testimony of TODOR COOKLEV, PH.D.; that said testimony was taken by me stenographically and thereafter reduced to typewriting under my direction; that reading and signing was requested; and that I am neither counsel for, related to, nor employed by any of the parties to this case and have no interest, financial or otherwise, in its outcome.

IN WITNESS WHEREOF, I have hereunto set my hand this 20th day of April 2022.



Monique Vouthouris, CCR, RPR, CRR

Notary Public of the State of New Jersey

My commission expires: April 8, 2024